#4

SEQUENCE LISTING

<110> Tse Wan Chang
Liming Yu

<120> Hybrid with Interferon-alpha and an Immunoglobulin Fc for Treatment of Tumors

<130> 95-2AAA

<140> 09/268,787
<141> 1999-03-16

<150> 08/994,719
<151> 1997-12-19

<150> 08/719,331
<151> 1996-09-25

<150> 08/579,211
<151> 1995-12-28

<160> 11

<170> FastSEQ for Windows Version 4.0

<210> 1
<211> 1254
<212> DNA
<213> Artificial Sequence

<220>
<221> CDS
<222> (1)...(1251)

<223> recombinant sequence based on human sequences

<400> 1

```
atg gcc ttg acc ttt gct tta ctg gtg gcc ctc ctg gtg ctc agc tgc      48
Met Ala Leu Thr Phe Ala Leu Leu Val Ala Leu Leu Val Leu Ser Cys
 1               5                  10                  15

aag tca agc tgc tct ctg ggc tgt gat ctg cct caa acc cac agc ctg      96
Lys Ser Ser Cys Ser Leu Gly Cys Asp Leu Pro Gln Thr His Ser Leu
            20                  25                  30

ggt agc agg agg acc ttg atg ctc ctg gca cag atg agg aaa atc tct     144
Gly Ser Arg Arg Thr Leu Met Leu Leu Ala Gln Met Arg Lys Ile Ser
        35                  40                  45

ctt ttc tcc tgc ttg aag gac aga cat gac ttt gga ttt ccc cag gag     192
Leu Phe Ser Cys Leu Lys Asp Arg His Asp Phe Gly Phe Pro Gln Glu
    50                  55                  60
```

```
gag ttt ggc aac cag ttc caa aag gct gaa acc atc cct gtc ctc cat      240
Glu Phe Gly Asn Gln Phe Gln Lys Ala Glu Thr Ile Pro Val Leu His
 65                  70                  75                  80

gag atg atc cag cag atc ttc aat ctc ttc agc aca aag gac tca tct      288
Glu Met Ile Gln Gln Ile Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser
                85                  90                  95

gct gct tgg gat gag acc ctc cta gac aaa ttc tac act gaa ctc tac      336
Ala Ala Trp Asp Glu Thr Leu Leu Asp Lys Phe Tyr Thr Glu Leu Tyr
            100                 105                 110

cag cag ctg aat gac ctg gaa gcc tgt gtg ata cag ggg gtg ggg gtg      384
Gln Gln Leu Asn Asp Leu Glu Ala Cys Val Ile Gln Gly Val Gly Val
        115                 120                 125

aca gag act ccc ctg atg aag gag gac tcc att ctg gct gtg agg aaa      432
Thr Glu Thr Pro Leu Met Lys Glu Asp Ser Ile Leu Ala Val Arg Lys
    130                 135                 140

tac ttc caa aga atc act ctc tat ctg aaa gag aag aaa tac agc cct      480
Tyr Phe Gln Arg Ile Thr Leu Tyr Leu Lys Glu Lys Lys Tyr Ser Pro
145                 150                 155                 160

tgt gcc tgg gag gtt gtc aga gca gaa atc atg aga tct ttt tct ttg      528
Cys Ala Trp Glu Val Val Arg Ala Glu Ile Met Arg Ser Phe Ser Leu
                165                 170                 175

tca aca aac ttg caa gaa agt tta aga agt aag gaa gag tcc aaa tat      576
Ser Thr Asn Leu Gln Glu Ser Leu Arg Ser Lys Glu Glu Ser Lys Tyr
            180                 185                 190

ggt ccc ccg tgc cca tca tgc cca gca cct gag ttc ctg ggg gga cca      624
Gly Pro Pro Cys Pro Ser Cys Pro Ala Pro Glu Phe Leu Gly Gly Pro
        195                 200                 205

tca gtc ttc ctg ttc ccc cca aaa ccc aag gac act ctc atg atc tcc      672
Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser
    210                 215                 220

cgg acc cct gag gtc acg tgc gtg gtg gtg gac gtg agc cag gaa gac      720
Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser Gln Glu Asp
225                 230                 235                 240

ccc gag gtc cag ttc aac tgg tac gtg gat ggc gtg gag gtg cat aat      768
Pro Glu Val Gln Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn
                245                 250                 255

gcc aag aca aag ccg cgg gag gag cag ttc aac agc acg tac cgt gtg      816
Ala Lys Thr Lys Pro Arg Glu Glu Gln Phe Asn Ser Thr Tyr Arg Val
            260                 265                 270

gtc agc gtc ctc acc gtc ctg cac cag gac tgg ctg aac ggc aag gag      864
Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu
```

```
          275                 280                 285

tac aag tgc aag gtc tcc aac aaa ggc ctc ccg tcc tcc atc gag aaa      912
Tyr Lys Cys Lys Val Ser Asn Lys Gly Leu Pro Ser Ser Ile Glu Lys
    290                 295                 300

acc atc tcc aaa gcc aaa ggg cag ccc cga gag cca cag gtg tac acc      960
Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr
305                 310                 315                 320

ctg ccc cca tcc cag gag gag atg acc aag aac cag gtc agc ctg acc     1008
Leu Pro Pro Ser Gln Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr
                325                 330                 335

tgc ctg gtc aaa ggc ttc tac ccc agc gac atc gcc gtg gag tgg gag     1056
Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu
            340                 345                 350

agc aat ggg cag ccg gag aac aac tac aag acc acg cct ccc gtg ctg     1104
Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu
        355                 360                 365

gac tcc gac ggc tcc ttc ttc ctc tac agc agg ctg acc gtg gac aag     1152
Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Arg Leu Thr Val Asp Lys
    370                 375                 380

agc agg tgg cag gag ggg aat gtc ttc tca tgc tcc gtg atg cat gag     1200
Ser Arg Trp Gln Glu Gly Asn Val Phe Ser Cys Ser Val Met His Glu
385                 390                 395                 400

gct ctg cac aac cac tac aca cag aag agc ctc tcc ctg tct ctg ggt     1248
Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Leu Gly
                405                 410                 415

aaa tag                                                            1254
Lys
```

<210> 2
<211> 417
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide sequence based on human sequence

<400> 2

```
Met Ala Leu Thr Phe Ala Leu Leu Val Ala Leu Leu Val Leu Ser Cys
 1               5                  10                  15
Lys Ser Ser Cys Ser Leu Gly Cys Asp Leu Pro Gln Thr His Ser Leu
            20                  25                  30
Gly Ser Arg Arg Thr Leu Met Leu Leu Ala Gln Met Arg Lys Ile Ser
        35                  40                  45
```

Leu Phe Ser Cys Leu Lys Asp Arg His Asp Phe Gly Phe Pro Gln Glu
50 55 60
Glu Phe Gly Asn Gln Phe Gln Lys Ala Glu Thr Ile Pro Val Leu His
65 70 75 80
Glu Met Ile Gln Gln Ile Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser
85 90 95
Ala Ala Trp Asp Glu Thr Leu Leu Asp Lys Phe Tyr Thr Glu Leu Tyr
100 105 110
Gln Gln Leu Asn Asp Leu Glu Ala Cys Val Ile Gln Gly Val Gly Val
115 120 125
Thr Glu Thr Pro Leu Met Lys Glu Asp Ser Ile Leu Ala Val Arg Lys
130 135 140
Tyr Phe Gln Arg Ile Thr Leu Tyr Leu Lys Glu Lys Lys Tyr Ser Pro
145 150 155 160
Cys Ala Trp Glu Val Val Arg Ala Glu Ile Met Arg Ser Phe Ser Leu
165 170 175
Ser Thr Asn Leu Gln Glu Ser Leu Arg Ser Lys Glu Glu Ser Lys Tyr
180 185 190
Gly Pro Pro Cys Pro Ser Cys Pro Ala Pro Glu Phe Leu Gly Gly Pro
195 200 205
Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser
210 215 220
Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser Gln Glu Asp
225 230 235 240
Pro Glu Val Gln Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn
245 250 255
Ala Lys Thr Lys Pro Arg Glu Glu Gln Phe Asn Ser Thr Tyr Arg Val
260 265 270
Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu
275 280 285
Tyr Lys Cys Lys Val Ser Asn Lys Gly Leu Pro Ser Ser Ile Glu Lys
290 295 300
Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr
305 310 315 320
Leu Pro Pro Ser Gln Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr
325 330 335
Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu
340 345 350
Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu
355 360 365
Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Arg Leu Thr Val Asp Lys
370 375 380
Ser Arg Trp Gln Glu Gly Asn Val Phe Ser Cys Ser Val Met His Glu
385 390 395 400
Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Leu Gly
405 410 415
Lys

<210> 3
<211> 2
<212> PRT
<213> Artificial Sequence

<220>

<223> artificial peptide linker sequence

<400> 3
Gly Ser
1

<210> 4
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide linker sequence

<400> 4
Gly Gly Ser Gly Gly Gly Ser
1 5

<210> 5
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide linker sequence

<400> 5
Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10

<210> 6
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide linker sequence

<400> 6
Gly Gly Gly Ser Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly
1 5 10 15
Ser

<210> 7
<211> 23
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide linker sequence

<400> 7
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly
1 5 10 15

Gly Ser Gly Gly Gly Gly Ser
20

<210> 8
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide linker sequence

<400> 8
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Gly Gly Ser Gly Gly
1 5 10 15
Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
20 25 30

<210> 9
<211> 40
<212> PRT
<213> artificial sequence

<220>
<223> artificial peptide linker sequence

<400> 9
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Gly Gly Ser Gly Gly
1 5 10 15
Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
20 25 30
Gly Gly Ser Gly Gly Gly Gly Ser
35 40

<210> 10
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial peptide linker sequence

<400> 10
Gly Gly Ser Gly Gly Ser
1 5

<210> 11
<211> 16
<212> PRT
<213> artificial sequence

<220>
<223> artificial peptide linker sequence

<400> 11
Gly Gly Ser Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser

1 5 10 15